AN EXAMINATION OF BUSINESS PROCESS REENGINEERING TECHNIQUES AND THEIR CONTRIBUTION TO PROCESS IMPROVEMENT

THESIS

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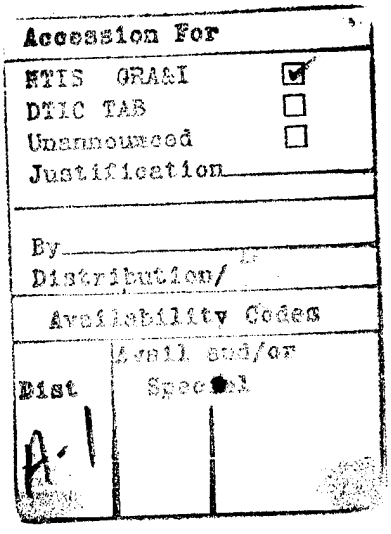

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Thomas M. McDonnell

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Abstract

The Department of Defense's Corporate Information Management Initiative is part of an effort to achieve savings through specified programs focused on business process improvement. A major process improvement methodology being used by the DoD is Business Process Reengineering (BPR). BPR offers the possibility for a fundamental rethinking and radical redesigning of DoD business processes, but there has been little systematic study of the effectiveness of the various techniques used in BPR projects. This study evaluates whether organizations conducting BPR efforts using five specific techniques (strategic planning, activity modeling, activity based costing, benchmarking, and simulation) achieve improvement in critical process performance measures. The survey was sent to two Air Force sample groups. The first group consisted of respondents to the Defense Information Systems Agency 1994 Business Process Reengineering Survey, and the second group consisted of members of the Air Force Institute of Technology Information Resource Management e-mail list. The survey resulted in a small sample of cases that were analyzed using descriptive statistics. The results of the survey indicate a surprisingly high success rate for BPR projects. Reliability analysis of the survey data was conducted and conclusions and recommendations for further research are presented.

AN EXAMINATION OF BUSINESS PROCESS REENGINEERING

TECHNIQUES AND THEIR CONTRIBUTION

TO PROCESS IMPROVEMENT

I. Introduction

Overview/Background

Organizations today are facing increasing competition. The evolution of the global marketplace has forced organizations to compete on a global scale. Success in this environment is based on an organization's ability to understand and satisfy customer requirements in an efficient and cost-effective manner. Therefore, organizations must be responsive to change and able to adapt quickly and efficiently to remain competitive. Because of this environment, organizations are being forced to reevaluate their business processes and look for better ways to do things at a lower cost. One of the methods that organizations are using to reevaluate their processes is known as business process reengineering (BPR). This concept is formally defined by Hammer and Champy as "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed" (Hammer and Champy, 1994:32).

The pressures for reengineering are just as intense in the public sector where shrinking budgets and public pressure for reform necessitate a change in the "business as usual" approach. There is currently a national effort to apply many of the same principles used in the private sector to the public sector. This effort is led by Vice President

Al Gore's National Performance Review. In this call to reinvent the federal government, specific recommendations are made for "reducing costs and waste; changing the way government operates; and making government more responsive and effective" (Gore, 1993).

A major component in the Department of Defense's effort to accomplish improvement is the Corporate Information Management initiative, which was established under the Office of the Assistant Secretary of Defense, Director of Defense Information. This initiative is part of an effort to achieve savings through specific programs focused on business process improvement (D. Appleton Co. 1993:V). This is part of an effort by the DoD to provide an overarching methodology for improvement projects, and it includes business process reengineering as one of the key methods to achieve process improvement. In 1992, the Director of Defense Information, issued the *Interim Management Guidance on Functional Process Improvement* (DoD 8020.1-M), which provides guidance on the methodology that should be used by DoD functional managers in improvement efforts (D. Appleton Co., 1993:V). This is the DoD regulation that provides specific guidance on business process reengineering efforts.

Despite the current level of interest in business process reengineering and the proliferation of literature on the subject, there has been little systematic analysis of the concept or methodology. Many of the factors contributing to the success or failure of reengineering projects are still unknown. This may explain why the reported failure rate of BPR efforts has been so high. Some estimate that as many as 70% of BPR projects fail to achieve the outcomes projected for the projects (Bashein, 1994:7). The high failure rates have caused organizations to seek further guidance on ways to minimize the risk of failure. One proposed solution is to establish a systematic methodology that can be followed for reengineering projects. However, such a methodology has yet to be accepted and validated. Some even argue against searching for a systematic methodology, insisting that

business process reengineering is more an art than a science (Davenport, 1994:18). These differing views do little to answer the questions and concerns of those who are seeking to reengineer processes.

Investigative Questions

A survey of Air Force organizations who have attempted BPR efforts could yield invaluable information about how to successfully reengineer processes. The DoD has established a framework for conducting BPR efforts, but the techniques contained in the guidance have not been tested empirically. Hence, an examination of the different techniques presented in DoD 8020.1-M (strategic planning, activity modeling, benchmarking, activity based costing, and simulation) could provide valuable information to help answer the question of whether or not organizations that conduct BPR projects using these techniques achieve improvements in critical process performance measures. The purpose of this thesis is therefore to undertake a systematic, scientific study of business process reengineering in the Air Force. Because of the relative newness of the subject area and lack of previous studies, it will be largely exploratory in nature. The following questions will be addressed:

1. Does the use of strategic planning, activity modeling, benchmarking, activity based costing, and/or simulation result in an improved process?

2. Do these techniques contribute to improving the performance of targeted organizational processes?

3. Are the resources expended in the use of each technique appropriate?

Scope of Research

The scope of the research will require the survey of Air Force organizations that have conducted BPR efforts. To accomplish this, the sample population will be derived from two sources. One portion will be taken from a list of DoD organizations that were

identified by the 1994 Defense Information Systems Agency (DISA) Government Business Process Reengineering survey as having recently conducted a BPR project. The other portion of the sample will consist of members of the Air Force Institute of Technology Information Resource Management e-mail group. The members of this group have been identified as having received BPR training and have had experience relating to Air Force BPR projects.

Despite the focus of this study on the affect of specific techniques on BPR projects, there are many other factors involved in determining the success or failure of BPR efforts. Many of these factors deal with existing preconditions within the organization such as leadership, communication, technology and human resource issues. Much literature has been devoted to the study of these factors on organizational change. However to limit the scope of this investigation, these factors will not be addressed.

Significance of Research

This research is essential if we are to gain a better understanding of business process reengineering initiatives. As stated above, very little academic evaluation of the methodology has been conducted. If organizations hope to successfully reengineer, the basic techniques of the methodology must be examined to determine if the activities add value to the process. In essence, this thesis is trying to hold the process of business process reengineering up to the same scrutiny that the methodology attempts to do with organizational processes. Only if this is accomplished can organizations effectively and efficiently attempt reengineering efforts.

Preview

The next chapter analyzes the existing literature on business process reengineering. The chapter will examine the current literature to define the characteristics of BPR. This examination will contain a comparison of these characteristics with the characteristics of

the Total Quality Management process improvement methodology. In addition, the differing techniques utilized in BPR projects will also be described and examined. Finally, the only current major study of BPR in the DoD, the Defense Information System Agency's 1994 Government Business Process Reengineering Survey will be reviewed. In Chapter III, the research methodology will be discussed. Chapter IV will examine and analyze the data obtained. Finally, Chapter V will provide conclusions and additional recommendations for research.

II. Literature Review

Introduction

This chapter will analyze the current literature available on business process reengineering in an effort to establish a methodology from which we can examine the techniques and tools commonly used in implementing BPR efforts. Because of the relative infancy of BPR, a standard method for evaluating BPR efforts has yet to be established. The majority of the information on BPR is provided in the form of case studies by pioneers such as Hammer and Champy, Davenport, and Harrington (Hammer and Champy, 1994; Davenport, 1993; Harrington, 1991). Therefore, our first step will be to define what business process reengineering is. This will be done by examining the definitions and characteristics attributed to the term in the literature on the subject.

Particular attention will be paid to reviewing the differences between business process reengineering and Total Quality Management. In addition, a discussion of where business process reengineering fits into the overall Corporate Information Management functional process improvement methodology will be conducted. This will be accomplished by reviewing the available DoD literature on the subject. Upon accomplishing this, the common techniques and tools associated with BPR will be examined. Finally, the 1994 Defense Information Systems Agency (DISA) Government Business Process Reengineering Survey will be reviewed.

Business Process Reengineering

To discuss BPR, we must first define what is meant by the term *business process* and examine why the focus on processes has become so important. A good definition of a business process is provided by D. Appleton Company in its publication, *Corporate Information Management: Process Improvement Methodology for DoD Functional*

Managers (D. Appleton Co., 1993). A business process is, "a collection of activities that work together to produce a defined set of products and services" (D. Appleton Co., 1993:153). Similarly, an *activity* "is a named process, function, or task that occurs over time and has a recognizable result. Activities use up assigned resources to produce products and services, and combine to form business processes" (D. Appleton Co., 1993:151).

The focus on the process is an essential element of BPR. During the industrial age, the specialization of labor and economies of scale yielded tremendous increases in production capacity. Organizations were structured to optimize cost, growth and control. These concerns resulted in hierarchical organizations which were structured into functional units. The benefits of this method of manufacturing outweighed the suboptimization of processes that resulted from the organizational structures (Hammer, 1990: 107).

"It should come as no surprise that our business processes and structures are outmoded and obsolete: our work structures and processes have not kept pace with the changes in technology, demographics, and business objectives" (Hammer, 1990: 107). These changes require a focus on processes to eliminate suboptimization. The view of the process as a specific ordering of work activities provides a structure for action, which is the key to achieving the benefits of process innovation (Davenport 1993: 4). Because most organizational processes cross functional or organizational barriers, the focus on processes will invariably be cross-functional or cross-organizational in its orientation (Davenport 1993: 4).

The focus on processes is centered upon three major objectives: making processes effective, making processes efficient, and making processes adaptable. The effectiveness of the process concerns the ability of the process to achieve the results desired by the organization, while the efficiency deals with minimizing the resources required to produce

the outcome. An objective that is becoming increasingly important in today's rapidly changing marketplace is the adaptability of the process. This is the ability of the process to adapt and change to meet customer and business needs (Harrington, 1991: 15). By focusing on processes, organizations increase their ability to directly achieve customer satisfaction. This focus on the customer is essential in today's competitive environment, and usually separates successful organizations from unsuccessful ones.

The focus on business processes is an important part of BPR, but does not distinguish it from other process improvement methodologies. What separates BPR is the nature of the change that it seeks. Because of the popularity of the concept of business process reengineering, the term has become a popular buzz word and is often misapplied. For the purpose of this study, I will rely on the Hammer and Champy definition of business process reengineering cited previously, "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed" (Hammer and Champy, 1993:32). Four words are key to this definition. The first key word is *fundamental*. This word stresses the fact that BPR forces people to challenge and reexamine rules and assumptions. "At the heart of reengineering is the notion of discontinuous thinking-- of recognizing and breaking away from the fundamental assumptions that underlie operations" (Hammer, 1990: 107). The second key word in this definition is *radical*, which comes from the Latin word meaning root. BPR seeks to attack the core or root of the problem, not promote superficial changes. BPR is reinvention, not improvement of the existing process. This idea leads to the third key word, which is *dramatic*. BPR seeks quantum leaps in performance, not incremental improvement. "Objectives of 5% or 10% improvement in all business processes each year must give way to efforts to achieve 50%, 100% or even higher improvement levels in a

few key processes" (Davenport, 1993: 1). Finally, the last key word is *process*. BPR focuses on processes, not outcomes (Hammer and Champy, 1993:32-35).

The critical enabler of business process reengineering is information technology. Information technology provides the ability to break long held assumptions and rules that govern processes. However, information technology should not be applied to existing processes with the expectation of process improvements. Automation is not reengineering. To fully capitalize on the potential power of information technology one must be able to think inductively. This is "the ability to first recognize a powerful solution and then seek the problem that it might solve" (Hammer, 1993: 84-85).

TQM vs BPR

Total Quality Management and business process reengineering have similar traditions and are often confused, but these methodologies are quite distinct from one another. While both TQM and BPR emphasize the importance of processes and focus on the needs of the process customer, there are important differences in the type of improvement that each methodology seeks. Quality programs seek continuous incremental improvement working within the framework of existing processes. Reengineering seeks breakthroughs by changing existing processes (Hammer, 1993: 49). A quick breakdown of the major differences is exhibited in Table 2-1 on the next page.

To achieve a greater appreciation of the differences between TQM and BPR, an examination of the histories and development of the methodologies is necessary. The beginning of TQM can be traced to the pioneering efforts of Shewart, Deming and others at Bell Laboratories in the 1930s. TQM was born out of a business improvement approach that emphasized "quality control." "Variation in the process was to be measured and minimized through statistical analysis, that is, statistical process control" (Davenport, 1993:320). Originally focused on improving the analysis and control of the

TABLE 1. TOTAL QUALITY MANAGEMENT VS. BUSINESS PROCESS REENGINEERING

	TQM	BPR
Level of Change	Incremental	Radical
Starting Point	Existing process	Clean Slate
Frequency of Change	One-time/continuous	One-time
Time Required	Short	Long
Participation	Bottom-up	Top-down
Typical Scope	Narrow, within functions	Broad, cross-functional
Risk	Moderate	High
Primary Enabler	Statistical control	Information Technology
Type of Change	Cultural	Cultural/Structural

(Adapted from Davenport, 1993: 11)

production of manufactured goods, the application has been expanded to all processes involved in producing quality products and services. Quality experts have further expanded the concept to include implications for management style, human resource policy, and other issues (Davenport, 1993:320-321).

TQM gained most of its current notoriety from its successful implementation by the Japanese. After World War II, Deming and other statisticians influenced the rebuilding of the Japanese industrial base with their theories of statistical process control. The concept, called kaizen in Japan, stresses the measurement of the process and elimination of variation in the pursuit of continuous incremental improvement. Although the possibility of radical process innovation existed, it was never emphasized by the quality experts in Japan. The disciplined approach of Kaizen seemed to fit the Japanese culture well, and Japanese economic success prompted western managers to examine the approach in an effort to increase western economic competitiveness (Davenport, 1993:312).

Continuous process improvement has met with mixed results in the United States. Perhaps some of these differences can be associated with cultural differences. Japanese quality expert Masaaki Imai commented in his article "Kaizen," that "Japanese companies generally favor the gradualist approach and Western companies the great-leap approach--an approach epitomized by the term innovation" (Imai, 1986:23).

By the mid to late 1980s many companies in the United States began to question whether continuous process improvement could meet the more radical needs of their businesses. Although radical process innovation was conceivably possible under TQM, no leading thinker about quality had seized upon the process improvement opportunities offered by information technology. Companies such as Xerox, IBM, Ford, CIGNA, Bank of America, Kodak, Hallmark, and Bethlehem Steel set out on the search for radical process innovation, utilizing technology as an enabler. It was no longer sufficient to improve the process. The process had to be reconstructed utilizing the possibilities created by the advancement of information technology. The concept of BPR gained widespread public recognition with the publishing of a groundbreaking article in the summer of 1990 by Michael Hammer (Hammer, 1990). This article popularized the concept of BPR by detailing the experiences of the aforementioned companies.

Hence, despite its similarity to TQM, BPR is actually an evolution of the concept and quite distinct from TQM. Both methodologies share some similar implementation techniques. But, because of its emphasis on technology, BPR is more heavily reliant on systems analysis and design techniques. These techniques will be discussed in the next section.

BPR in the CIM Functional Process Improvement Methodology

The collective term for the improvement methodology adopted by the DoD is Functional Process Improvement. It divides improvement efforts into three categories:

Continuous Process Improvement, Business Process Redesign, and Business Process Reengineering. The *Framework for Managing Process Improvement: A Guide to the Methodology*, written by Robert J. Davis to support the Corporate Information Management effort, provides excellent definitions for the various methodologies:

> Continuous process improvement (CPI). Continuous process improvement is most closely associated with the Total Quality Management (TQM) discipline. The traditional approach is to empower self-managed teams to make task-level improvements in quality, cycle time, and cost. Improvements are incremental and sustained. They are creative responses to the constant need to get the job done in changing circumstances. CPI actions typically are wholly contained within one functional activity, although cross-functional teams can be organized to deal with chronic or pervasive situations. To use an analogy, the objective of a CPI team is to tend to one or two trees in the forest.
>
> Business process redesign (BPR). Process redesign is the next level of improvement. BPR actions are undertaken in a project context with planned or specific improvement objectives. The focus is on streamlining processes by detecting and eliminating non-value added process time and costs, and incorporating best practices in whole or in part. Moderate improvement in quality with respect to output products and services is usually one of the objectives of BPR. Processes generally remain intact with respect to other related processes, and there is little to moderate impact on existing supporting information systems....To continue the analogy, the forest is managed in spite of all the trees.
>
> Business process reengineering (BRE). Process reengineering is often undertaken in response to dramatic changes in the external environment (a paradigm shift, for instance) that apply considerable pressure on the ability of the organization to fulfill its mission, improve its competitive positioning, or to even survive as an entity. BRE actions are radical and transforming. The focus is on the end-to-end process or a considerable subset of that process. Virtually all functions within the organization are affected by BRE actions. The existing organizational and technological infrastructure are subject to major dislocations, and pressure is applied to the very culture of the organization....To complete the analogy, the objective of the BRE team is to create a new forest with sturdier and more valuable trees. (Davis, 1994: 2-11,2-12)

The improvement methodologies presented in this model subsume the TQM and BPR improvement methodologies presented earlier in this paper. An additional distinction is adding an intermediate level of improvement, business process redesign. For the purpose of this study we will continue to refer to business process reengineering by its commonly recognized acronym BPR.

The DoD has published guidance on process improvement methodologies, contained primarily in three documents: *DoD 8020.1-M, Interim Management Guidance on Functional Process Improvement; Corporate Information Management: Process Improvement Methodology for DoD Managers;* and *Framework For Managing Process Improvement: A Guide to the Methodology* (DoD, 1992; D. Appleton Co., 1993; Davis, 1994). These three sources currently provide the framework for all BPR projects in the DoD.

The primary purpose of these documents is to apply the theoretical concepts of BPR into a practical model that can be applied to organizational processes within the DoD. The application of BPR is a difficult and challenging task that is by no means trivial. These DoD documents attempt to simplify the process of applying the concepts of BPR by producing a methodology consisting of a sequence of techniques that will allow organizations to successfully reengineer processes. The following section is a breakdown of the methodology and techniques contained in these three documents.

BPR Methodology

The methodology for BPR provided in DoD 8020.1-M can be broken down into seven basic steps (see Figure 1). These seven steps contain the five techniques that this study will investigate.

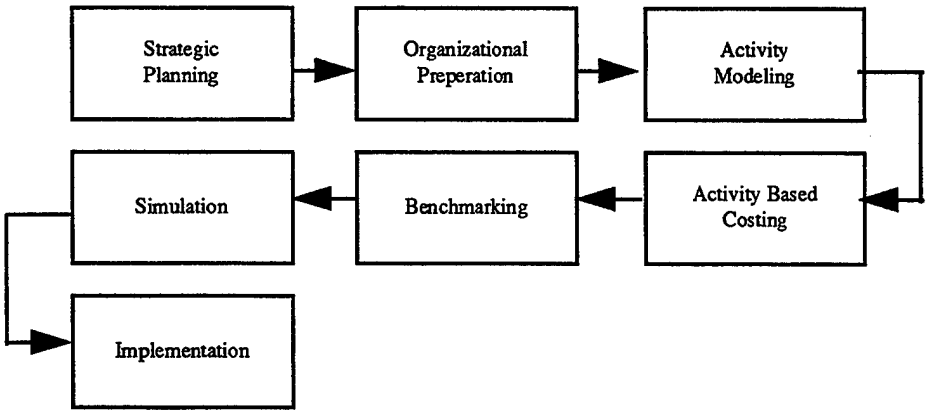

FIGURE 1. BPR Methodology (Adapted from Teal, 1994)

Strategic Planning. The first technique to be examined is strategic planning. Strategic planning is the technique that the organization uses to establish the context in which it will operate with respect to its defined mission. The strategic plan also establishes the vision for the desired state of the organization. "The strategic plan is developed by considering the interrelationships of mission, customer base requirement, and environment with respect to potential organizational performance" (Davis, 1994:4-3). The development of a strategic plan includes: the identification of major customer groupings and requirements; an analysis of its strengths, weaknesses, opportunities and threats with respect to the external environment; an identification of the core competencies of the organization; and identification of breakthrough objectives for the organization. Strategic planning provides the context for determining which BPR projects should be undertaken (Davis 1994:4-4).

Strategic planning should be a key component in any BPR effort. Without proper identification and prioritization, BPR efforts might not be targeted at the processes that are truly critical to the organization.

> Process innovation is meaningful only if it improves a business in ways that are consistent with its strategy. In fact, process innovation is impossible - or at least only accidental - unless the lens of process analysis is focused on

> a particularly strategic part of the business, with particular strategic objectives in mind. (Davenport, 1993: 117)

Because of the radical nature of BPR, it is even more essential to associate process improvement efforts with specific strategic and business goals (Davis 1994: 4-1).

Activity Modeling. The next technique to be examined in this study is activity modeling. Activity modeling is a technique that "portrays how a business process is currently structured. It is used to establish a baseline for subsequent business process improvement actions or programs" (Davis, 1994: A-1). Modeling is used by organizations to enhance the understanding of the process. The use of modeling helps the organization identify the scope and requirements of projects. It also helps to identify areas of difficulty and opportunities for improvement. Modeling provides a method of communication which is especially important when the process that is being reengineered is cross-functional (Teal, 1994: slide 2.1.6).

There are many ways to perform activity modeling, but the DoD Corporate Information Management Information Technology Policy Board has mandated IDEF0 as the standard for DoD activity modeling. IDEF0 is a structured modeling technique that was developed by the Department of Defense. This study will therefore limit its definition of activity modeling to IDEF0 since its use is mandated for the target organizational population.

Activity Based Costing. Activity based costing is "an accounting technique that allows an enterprise to determine the actual costs associated with each product and service produced by that enterprise without regard to the organizational structure of the enterprise" (Davis, 1994: A-1). Activity based costing allows the organization to use the previously established activity model to assign costs to specific activities that are not accounted for in traditional accounting techniques. This provides the organization with more accurate costing information and improves the organization's ability to discriminate between value-added and non-value-added activities. A value-added activity is defined as

an activity with input costs plus activity costs that are lower than the value of its output product or service. Correspondingly, a non-value-added activity is defined as an activity with input costs plus activity costs that exceed the value of its output product or service (D. Appleton Co., 1993:103).

Benchmarking. The technique of benchmarking facilitates the development of alternative solutions. Benchmarking is a technique for

> measuring processes against those of recognized leaders to establish priorities and targets leading to process improvement. It is undertaken by identifying strategies, customers, processes and costs to benchmark and their key characteristics; determining who to benchmark; collecting and analyzing data from direct contact, survey, interview, technical journals, and advertisements; determining the "best of class; from each benchmark item identified; and evaluating the process in terms of improvement goals. (Davis, 1994: A-2)

There are four typical types of benchmarking used by organizations. *Internal benchmarking* is the comparison of similar processes within an organization. Internal benchmarking is the easiest type of benchmarking to accomplish because of the availability of information. *Competitive benchmarking* is the comparison of products or processes to that of competitor organizations. Competitive benchmarking is perhaps the hardest type of benchmarking to accomplish because access to data is very limited. *Functional benchmarking* is the comparison of similar processes within the same broad industry. An example of functional benchmarking would be Harley Davidson comparing its production to that of General Motors. Finally, *generic benchmarking* is the comparison of processes regardless of the industry from which the processes come from. This is the most useful form of benchmarking, because observations are limited to the best practices (Teal, 1994: slide 3.3.9).

Simulation. Simulation is the technique of modeling the implementation of alternative solutions to evaluate their effectiveness. The technique relies on computers and simulation theory to allow the organization to more effectively and efficiently evaluate alternatives.

1994 DISA Government Business Process Reengineering Survey

The only current DoD study concerning business process reengineering was accomplished by DISA's Center for Functional Process Improvement Expertise. This study was undertaken in August 1994. The study was conducted by sending out a survey questionnaire to 1500 respondents and sought to gather information on:

a. Past, currently ongoing, and planned future BPR projects;
b. The tools and techniques used in these projects;
c. Readiness of government organizations to undertake BPR and services which may be needed; and
d. Barriers encountered in performing BPR, the techniques used to overcome those barriers, and the degree of success of the BPR projects. (Center for Information Management, 1994)

The study yielded a 16 percent response rate, with 246 of the surveys being returned by the September 1994 due date. The survey responses revealed that 30.1 percent of the respondents who responded to questions concerning past, current, and future BPR projects had completed a BPR project, 49.0 percent were currently working on a BPR project, and 18.8 percent were planning to initiate a project. Of the respondents who had completed BPR projects, 21.7 percent rated their projects as "very successful" and another 53.0 percent rated their projects as "somewhat successful." Of the projects rated by the respondents as less than "very successful," the most cited barrier to success was lack of management support (42.3 percent), followed by insufficient elapsed time (33.3 percent) and lack of available personnel (32.1 percent) (Joint Interoperability and Engineering Organization, 1995).

The survey asked respondents whether they previously, currently, or planned to use twenty-six specific improvement techniques. The five techniques identified in this study were among the twenty-six identified in the DISA study. The survey results for the five techniques being examined in this study are contained in Table 2-2 below.

TABLE 2. DISA SURVEY RESULTS FOR TECHNIQUE USAGE

	Planned	**Currently**	**Previously**
Competitive/ Strategic Management	15.9%	13.4%	8.1%
Activity Modeling, IDEF0	37.4%	33.7%	30.5%
Activity Based Costing	30.9%	20.3%	19.5%
Process Benchmarking	24.4%	16.7%	14.6%
Process Simulation	19.1%	8.5%	8.5%

(Joint Interoperability and Engineering Organization, 1995)

The survey also identified specific tools associated with some of the techniques and asked respondents to rate organizational satisfaction with the tools.

While this survey reveals valuable information concerning business process reengineering, the survey does not provide information which directly addresses the investigative questions of this thesis. First, the survey failed to make a distinction between the different types of process improvement. This makes it difficult to determine whether the information gathered concerns BPR projects or continuous improvement projects. In addition, the survey does not address the utility of techniques, but instead focuses on the utility of specific tools. Finally, issues of reliability and validity do not appear to have been taken into account in the construction of the survey. However, the survey still presents a valuable starting point for continuing study of BPR issues, and its creation of a database

of organizations who have begun process improvement projects makes further more rigorous study of BPR issues within the DoD possible.

Summary

BPR is a relatively new methodology and little scientific and academic study of the subject has been done. The majority of the literature about BPR is confined to analysis of case studies and anecdotal evidence. This section provided an examination of the basic characteristics of business process reengineering as provided by the pioneers such as Hammer and Champy, and Davenport. The relationship of BPR within the Corporate Information Management overall functional process improvement methodology was also examined and evaluated. The section also contained a definition and examination of the techniques specified in DoD 8020.1-M. These techniques have been presented and endorsed by the DoD in an attempt to enhance the probability of successful business process reengineering. However, the use of these techniques requires a major commitment of resources by the organization, and their implementation can be expensive. Research must be done to evaluate the contribution of these techniques.

The final section of this chapter examined the only current study of BPR within the DoD. While this study gathered a lot of data concerning BPR within the DoD, the study did little to answer the investigative questions of this thesis. The rest of this study will try to build upon the information gathered in this study and make use of additional scientific rigor in an attempt to determine if the five techniques presented in this chapter increase the probability of successful process reengineering.

III. Method

Introduction

This chapter will discuss the method used to answer the question of whether BPR projects conducted by organizations using the techniques specified in 8020.1-M result in improved processes. First, the investigative questions will be restated. Then, the creation of the survey instrument will be covered. This will be followed by a discussion about the sample. Finally, the methods used to analyze the data will be reviewed.

Investigative Questions

Several questions must be answered to accomplish the purpose of this study:

1. Does the use of strategic planning, activity modeling, benchmarking, activity based costing, and/or simulation result in an improved process?

2. Do these techniques contribute to improving the performance of targeted organizational processes?

3. Are the resources expended in the use of each technique appropriate?

Instrument Creation

Because of the absence of previous studies dealing with the investigative questions stated above, a survey instrument was constructed. The first part of the survey was constructed to measure demographic information about the responding organization. This information provided valuable descriptive information about the responding sample. The second part of the survey contained measurement questions to determine whether the process improvement effort undertaken by the organization was a BPR effort. This was done by creating questions to determine whether the functional process improvement effort meets the criteria of the Hammer and Champy definition. The survey contains definitions of both TQM and BPR process improvement efforts and examples of each.

The respondent was then asked to state which definition best fits their process improvement effort. This question was followed by five questions concerning the process improvement effort which the respondent was supposed to answer using a five point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." These questions were used to evaluate the reliability of the respondent's classification of their process improvement effort.

The next section of the survey was created to measure whether the organization used each of the five techniques specified in DoD 8020.1-M. Measurement items were created using the following operational definitions to measure whether the organization used a particular technique.

Strategic Planning. The use of strategic planning was defined in the context of this study as the establishment of an organization plan that considers the interrelationships of mission, customer base requirements, and environment with respect to potential organizational performance as part of the reengineering process or the use of reengineering to meet the goals and objectives of an already established strategic plan (Davis, 1994:4-3).

Activity Modeling. The use of activity modeling was defined as the use of IDEF0 methodology to establish a current process baseline.

Activity Based Costing. The use of activity based costing was defined as the use of an activity model to establish the costs of each activity so that the organization can discriminate between value added and non-value added activities.

Benchmarking. The use of benchmarking was defined as the measuring of processes against alternative processes.

Simulation. The use of simulation was defined as the modeling of proposed processes to evaluate their potential effectiveness.

Additional questions were asked to measure the contribution of each technique to reengineering the process, and the appropriateness of resource expenditure for each technique. Two questions were used for each of these measurements to accommodate reliability analysis. This section of the survey utilized a five point Likert scale with "Strongly Disagree" and "Strongly Agree" as the anchor points.

Process Improvement Measures. The level of process improvement of the reengineered process was acquired by asking the users to compare the process that existed prior to reengineering, to the reengineered process using contemporary process measures. Four categories of contemporary performance measures were used in this study. The first was *fitness for purpose*. This process measure provides a way to measure the effectiveness of a process or product with respect to stakeholders interests. Another performance measure used was *conformance to standards*. This provided a way to measure the quality aspects of a process or product. A third performance measure used was *process time measure*, which quantified the response and cycle times of a process. The final performance measure used was *process cost measure*, which weighed the efficiency and productivity measures of a process (Davis 1994:4-9). The items constructed to measure these constructs used a five point Likert scale ranging from "Decidedly Worse" to "Decidedly Better" to indicate the magnitude of how much better or worse the reengineered process was concerning these performance measures. Two survey items were used for each of the performance measures to allow the reliability of the responses to be evaluated.

The survey was reviewed prior to conducting the study. A member of the BPR project at the Air Force Materiel Command headquarters was asked to evaluate the survey prior to it being sent out. Suggestions and comments were used to revise and improve the survey instrument. The survey was then forwarded to the Air Force Institute of

Technology survey control office and the appropriate Air Force organizations for approval and receipt of an Air Force survey control number.

Sample

The survey was sent to two separate sample groups; the first group consisted of the Air Force organizations that responded to the 1994 Defense Information Systems Agency (DISA) Business Process Reengineering Survey, and the second group consisted of the members of the Air Force Institute of Technology Information Resource Management e-mail list. The DISA respondents were used because they have already identified themselves as having conducted BPR efforts and represent an excellent source of information. The membership of the Air Force Institute of Technology Information Resource Management e-mail group consists of individuals who have completed a master's degree in Information Resource Management at the Air Force Institute of Technology. These individuals have received training in BPR and have experience relating to Air Force BPR projects.

The survey sample was selected in an attempt to identify individuals who had been members of BPR project teams. BPR teams are supposed to be comprised of the process' operational experts. Therefore, these people are the prime sources of information concerning the comparison of the process that existed before and after reengineering. In addition, these are also the individuals who can provide the information concerning the contribution and appropriateness of resource expenditure of each technique.

Analysis

The data gathered was compiled and analyzed in the following chapter of this study. Descriptive statistics were used to analyze the data. The Pearson Product Moment Correlation of questions was used to help determine the correlation of the responses of Question 5 with the responses to Questions 6-9. Cronbach's alpha coefficient was used to

test the reliability of the responses to various questions. The results are presented and analyzed in Chapters Four and Five.

Summary

This study required the creation of a survey instrument in an attempt to answer the investigative questions. This chapter presented the operational definitions used in the construction of the survey, and discussed the selection of the survey sample. The survey sample was chosen to include the respondents to the 1994 DISA Business Process Reengineering Survey and the members of the Air Force Institute of Technology Information Resource Management e-mail group. The results and analysis are contained in the next two chapters.

IV. Results and Analysis

Chapter Overview

This chapter will present the results of the survey and analyze the survey responses. The analysis of the survey results will cover analysis of the responses to: survey background questions (questions 1-4); responses concerning the definition of the process improvement efforts (questions 5-9); responses comparing the improved process to the one that existed prior to the improvement efforts (questions 40-47); and the contributions of the individual process improvement techniques (questions 10-39). The results of this survey will then be compared to the results from DISA's 1994 Government Business Process Reengineering Survey. Finally, issues concerning the validity and reliability of this study's data will be addressed.

Background

The survey was sent to two separate sample groups. The first group consisted of 28 Air Force employees who had previously responded to the DISA survey. The survey used in this study was sent out between 15 May 95 and 22 May 95. All of the responses to the survey were received by the 15 June 1995 deadline. The second group of individuals was comprised of the members of the Air Force Institute of Technology Information Resource Management e-mail group. These surveys were sent out in electronic format on 11 June 95. All of the responses were received by 21 June 1995.

Survey Results

General Survey Results. Of the 28 individuals who had previously responded to the 1994 DISA study, 12 responded to the current survey. This corresponds to a response rate of 43%. Two surveys were returned as undeliverable, so approximately

50% of the eligible individuals responded. Of the returns, one case was dropped from the sample for reasons of invalid data.

The survey was sent out to the entire e-mail group consisting of approximately ninety-eight people. Ten people responded to the survey. Only those individuals who had been involved in process improvement efforts were asked to respond.

Due to the small number of cases, the statistics produced by the current study lack great statistical power. Given this situation, tests were limited to the generation of descriptive statistics.

Background Questions. There were four questions included in the survey used to gather background information. All 21 of the respondents answered these questions. The first question was:

> **1. Please identify the DoD component in which your organization is located.**

Twenty of the twenty-one respondents worked directly for an Air Force organization and one respondent worked in the Office of the Secretary of Defense.

The second and third questions asked if the organizations used DoD 8020.1-M, *Interim Management Guidance on Functional Process Improvement* to guide their process improvement efforts. The two questions were as follows:

> **2. Did the organization use DoD 8020.1-M to guide their process improvement project?**

> **3. Did the organization receive training on the process improvement methodology specified in DoD 8020.1 M?**

The distribution of the responses to these questions were identical. Twelve (57.14%) answered "Yes" to each of the questions, five (23.81%) answered "No", and four (19.05%) answered that they "Do Not Know." The correlation between responses to Question 2 and 3 was .93. It was statistically significant at $p < .01$.

The responses to Question 3 were tied closely with the responses to Question 4:

4. If training was received, which of the following techniques did the training cover?

The frequencies for responses to this question are shown in Table 4-1 below.

TABLE 3. DISTRIBUTION OF RESPONSES FOR QUESTION 4

	1 Strategic Planning	2 IDEF0 modeling	3 Activity-based costing	4 Benchmark-ing	5 Simulation
Frequency	7	13	11	8	3

Of the twelve people who responded "Yes" to Question 3, all had received training in one of the techniques listed in Question 4. Additionally, nine of the people who responded "Yes" to Question 3 had received training in two or more of the techniques listed in Question 4. Two people answered "No" to Question 3, but responded that they had received training in one of the techniques listed in Question 4. This suggests that some individuals may have lacked specific knowledge about 8020.1-M.

Definition of Process Improvement Efforts. One of the objectives of the study was to distinguish BPR projects from other similar kinds of projects, particularly TQM projects. In an effort to address this issue, the survey contained five questions that were constructed to define what type of process improvement effort was undertaken by the respondent. Definitions of Total Quality Management and Business Process Reengineering were provided to the respondent as well as examples of each type of process improvement effort (see Appendix, p. B-1). The respondent was then asked which of the definitions best fit their organization's process improvement project. The response distribution is contained in Table 4-2.

TABLE 4. PROCESS IMPROVEMENT PROJECT DEFINITION, QUESTION 5

	1 Total Quality Management	2 Business Process Reengineering	3 Undecided
Frequency	7	13	1

Questions 6-7 were used to verify the accuracy of the respondent's classification of their project as BPR or TQM. The respondent was asked to use a 5 point Likert scale ranging from "Strongly Disagree" to "Strongly Agree" to answer the following questions:

6. Our process improvement effort attempted to achieve improvement greater than 50% in cost, quality, and/or customer service.

7. Our process improvement effort was aimed at achieving improvement less than 10% in cost, quality, and/or customer service.

8. Our process improvement recommendations involved the use/introduction of information technologies.

9. Our process improvement effort crossed several functional areas.

Positive correlations were expected between the responses to Question 5 and the responses to Question 6, 8 and 9 because these items represented key features of the BPR process. The correlations are shown in Table 4-3.

TABLE 5. PEARSON PRODUCT MOMENT CORRELATION OF QUESTION 5 WITH QUESTIONS 6-9

	Question 6	Question 8	Question 9
Question 5	.4622*	.4016*	.6032*

*p < .05 19 Cases Included

In addition, a negative correlation between Question 5 and Question 7 was expected, because this item represented a key feature of a TQM process. The Pearson Product

Moment Correlation value for Question 5 and Question 7 was -.6424. All of the correlations tested were statistically significant at $p < .05$.

An additional method used to verify the accuracy of the respondent's project classification involved comparing the response chosen to Question 5 with the techniques used during their process improvement effort. While most TQM projects traditionally utilize strategic planning and benchmarking in their process improvement efforts, the techniques of activity modeling, activity based costing, and simulation are usually associated with the newer process improvement methodology, BPR. An analysis of this hypothesis further supports the findings that the respondents consistently and correctly defined their improvement efforts. Five of the seven organizations conducting projects defined as TQM by the respondents had strategic plans, while ten of the thirteen BPR projects had strategic plans. In addition, four of the seven TQM projects utilized the technique of benchmarking, while 9 of the 13 BPR projects used this technique. However, only one TQM project utilized IDEF0, two used activity based costing, and one used simulation. The corresponding numbers for BPR projects were higher: 8 of 13 for IDEF0 modeling, 5 of 13 for activity based costing, 4 of 13 for simulation. These findings are consistent with the techniques associated with the respective process improvement methodologies.

Based upon these results, Questions 6-9 were used to classify the process improvement effort for the one respondent who was "Undecided" concerning the designation of their process improvement effort. The response was judged to be a TQM effort based upon these responses.

Overall Outcomes of Process Improvement Efforts. The outcomes of the BPR efforts were surprisingly positive. As noted earlier in this paper, a high number of BPR projects fail. However, the results of this study indicated that a majority of the

respondents reported that the process improvement efforts that their organizations had undertaken had resulted in improved processes.

The respondents were asked to compare the process that resulted from their improvement efforts to that which existed prior to their improvement efforts using a five point Likert scale that ranged from "Decidedly Worse" to "Decidedly Better". The respondents were asked to make this comparison in four categories of contemporary performance measures: fitness for purpose, conformance to standards, process time measure, and process cost measure. Each of these performance dimensions was indexed by two questions. The mean score and standard deviation on each of the four performance measures for BPR projects, are contained in Table 4-4.

TABLE 6. MEAN RATINGS OF PROJECT EFFECTIVENESS

	Fitness for Purpose		**Conformance to Standards**		**Process Time Measure**		**Process Cost Measure**	
	$\bar{x}$	**SD**	$\bar{x}$	**SD**	$\bar{x}$	**SD**	$\bar{x}$	**SD**
BPR Projects	4.238	.021	4.048	.212	4.095	.181	4.286	.197

These data suggest that the process resulting from their improvement efforts was better than the one that existed prior to the project.

Contributions of Techniques.

Strategic Planning. There were seven questions dealing with strategic planning in this study. The respondents were asked to respond to the questions using a five point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." The seven questions were as follows:

10. Our organization has a strategic plan.

11. Our process improvement effort directly resulted from an issue/problem identified from our strategic planning process.

12. Our process improvement effort directly supported one or more goals contained in our strategic plan.

13. My organization devoted the correct amount of resources (time, money, manpower) to the process of strategic planning.

14. My organization devoted more than the required amount of resources (time, money, manpower) that were necessary for the successful accomplishment of strategic planning.

15. Strategic planning contributed to the success of our process improvement effort.

16. Strategic planning was not useful to our process improvement effort.

The responses to these seven questions were generally positive and a breakdown of the numbers of "Agree" and "Strongly Agree" responses are contained in Table 4-5 on the next page. The results also support a difference in the contribution of strategic planning between BPR and TQM, which further supports the survey's accuracy in distinguishing between the two process improvement methodologies.

While fifteen of the 21 respondents answered that their organization had a strategic plan, only five stated that their process improvement project resulted from a problem or issue identified in their strategic planning process. This discrepancy was most decidedly pronounced among the organizations pursuing TQM projects. While six of the eight organizations pursuing TQM projects had strategic plans, none indicated that their projects resulted directly from a problem or issue identified by the strategic planning process. These results support the expectation that the strategic planning process may be more useful with conducting BPR projects than with TQM projects.

Results of Questions 13, 15, and 16 also support this conclusion. Seven of the thirteen BPR respondents stated that strategic planning contributed to the success of their process improvement effort, while none of the TQM respondents stated this. Three of the

TABLE 7. FREQUENCY OF AGREE AND STRONGLY AGREE RESPONSES FOR QUESTIONS 10-15

	All Projects	BPR Projects	TQM Projects
Question 10	15	9	6
Question 11	5	5	0
Question 12	10	7	3
Question 13	4	4	0
Question 14	2	1	1
Question 15	7	7	0
Question 16	3	0	3

eight TQM respondents stated that strategic planning was not useful to their process improvement effort, while none of the BPR respondents stated this. Finally, four of the thirteen BPR respondents stated that their organizations devoted the correct amount of resources to their strategic planning process while none of the TQM respondents did so.

One possible explanation for this is the degree of risk associated with the respective process improvement efforts. BPR projects have a higher degree of risk. Therefore it may be, organizations mandate that strategic planning be conducted in conjunction with BPR process improvement efforts precisely because of the risk and expense associated with these efforts. Hence, the strategic planning process would be more vital to the actual process improvement efforts. TQM projects are usually less risky and take place over a longer period of time. It would be possible for an organization to establish a strategic plan that provides guidance concerning the goals of the organization, but does not specifically address process improvement efforts. This would be consistent with the agreement of the TQM respondents that their process improvement efforts support the goals of the organization's strategic plan, but that the strategic planning process is not integral to the process improvement effort.

Another explanation could deal with the progressiveness of the organizations undertaking process improvement efforts. Organizations undertaking BPR might be more

progressive and therefore would ensure that strategic planning is integral to their process improvement efforts. Regardless of the reason, the distinct difference in the contribution of strategic planning in process improvement efforts between the two methodologies would provide support to the classification of the projects in this study.

Activity Modeling. There were five questions concerning activity modeling in this study. The respondents were asked to rate the questions using a five point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." The five questions were as follows:

17. My organization conducted IDEF0 modeling as part of its process improvement methodology.

18. My organization devoted the correct amount of resources (time, money, manpower) to the process of IDEF0 modeling.

19. My organization devoted more than the required amount of resources(time, money, manpower) that were necessary for the successful accomplishment of IDEF0 modeling..

20. IDEF0 modeling contributed to the success of our process improvement effort.

21. IDEF0 modeling was not useful to our process improvement effort.

Of the thirteen organizations that had conducted BPR efforts, nine identified themselves as having conducted IDEF0 modeling efforts as part of their process improvement efforts. One of the organizations that stated that they were conducting IDEF0 modeling was just beginning to use the technique and did not respond to Questions 18-21. Of the organizations using IDEF0 modeling, six "Agree" or "Strongly Agree" that the technique contributed to the success of their process improvement efforts. In addition, six of the nine organizations stated that their organization devoted the correct amount of resources

to IDEF0 modeling, and none thought that their organization devoted too many resources to the technique.

From these results it appears that those organizations that have used IDEF0 modeling thought that the technique contributed to their improvement efforts and that their organizations were contributing the proper amount of resources to the application of the technique.

Activity Based Costing. There were also five questions concerning activity based costing in this study. The respondents were asked to rate the questions using a five point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." The five questions were similar in structure to the IDEF0 questions and were as follows:

22. My organization conducted activity based costing as part of its process improvement methodology.

23. My organization devoted the correct amount of resources (time, money, manpower) to the process of activity based costing.

24. My organization devoted more than the required amount of resources (time, money, manpower) that were necessary for the successful accomplishment of activity based costing.

25. Activity based costing contributed to the success of our process improvement effort.

26. Activity based costing was not useful to our process improvement effort.

Of the thirteen organizations that had conducted BPR efforts, five organizations responded that they had conducted activity based costing. Of these five, three either "Agree" or "Strongly Agree" that activity-based costing contributed to their process improvement effort. One of the respondents answered "Disagree" and the fifth responded "Neither Agree nor Disagree" to this question. In addition, four of the five respondents felt that their organization had devoted the correct amount of resources to the application

of the technique. The other respondent answered "Disagree" with this statement. However, none of the respondents felt that the organization devoted more than the required amount of resources.

The results of the questions regarding activity-based costing are very similar to those regarding IDEF0. It appears that the organizations that are using the technique feel that it has value and that they are devoting the correct amount of resources to its application.

Benchmarking. There were seven questions concerning benchmarking in this survey. The respondents were asked to rate the questions using a five point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." The questions were as follows:

27. My organization used benchmarking as part of its process improvement methodology.

28. My organization benchmarked the process that was to be improved with processes that were similar within the organization.

29. My organization benchmarked the process that was to be improved with processes that were similar and found in other organizations.

30. My organization benchmarked the process that was to be improved with processes that were found in different industries.

31. My organization devoted the correct amount of resources (time, money, manpower) to benchmarking.

32. My organization devoted more than the required amount of resources (time, money, manpower) that were necessary for the successful accomplishment of benchmarking.

33. Benchmarking contributed to the success of our process improvement effort.

34. Benchmarking was not useful to our process improvement effort.

Results of these questions are located in Table 4-6 below. The table contains the frequencies of "Agree" and "Strongly Agree" responses for BPR Projects.

TABLE 8. FREQUENCIES OF AGREE AND STRONGLY AGREE RESPONSES FOR QUESTIONS 27-34

	Frequency
Question 27	9
Question 28	6
Question 29	8
Question 30	4
Question 31	5
Question 32	0
Question 33	5
Question 34	0

Of the thirteen respondents that identified their organizations as having conducted BPR efforts, nine answered Questions 31-34. Of these nine, 5 "Agree" that benchmarking contributed to the success of their process improvement effort. No one answered "Disagree" or "Strongly Disagree" to the statement. In addition, of the nine, five "Agree" or "Strongly Agree" that their organizations devoted the correct amount of resources to benchmarking. Three individuals "Disagree" with this statement. None of the respondents "Agree" or "Strongly Agree" that the organization devoted too many resources to benchmarking

From the results of the survey, it appears that benchmarking is being used widely in BPR efforts and that those organizations using it are devoting the proper amount of

resources to the effort. For the organizations that are not devoting the correct amount of resources, they may be devoting too little to benchmarking efforts. However, it does not appear that they are devoting too many resources to the application of this technique. Over half of the organizations using the technique report that it contributed to the success of their process improvement effort.

Simulation. There were five questions concerning simulation in this study. The respondents were asked to rate the questions using a five point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." The five questions were similar in structure to the IDEF0 and activity based costing questions and were as follows:

35. My organization used simulation as part of its process improvement methodology.

36. My organization devoted the correct amount of resources (time, money, manpower) to simulation.

37. My organization devoted more than the required amount of resources (time, money, manpower) that were necessary for the successful accomplishment of simulation.

38. Simulation contributed to the success of our process improvement effort.

39. Simulation was not useful to our process improvement effort.

There were five respondents that identified their organizations as having conducted simulation in their process improvement efforts. As stated earlier, four of the five organizations were pursuing BPR efforts. Of the four organizations conducting BPR efforts and utilizing simulation, two of the respondents agreed that simulation contributed to the success of their process improvement efforts. One individual responded that they "Disagree" with the statement, one answered "Neither Agree nor Disagree." Of the four organizations, three of the four respondents "Agree" that their organizations utilized the correct amount of resources, one organization answered "Disagree" to this statement.

None of the organizations "Agree" or "Strongly Agree" that their organization devoted more than the required amount of resources that were necessary for the successful accomplishment of simulation.

Comparison With DISA Data

While the survey administered in this study and the one issued by DISA are quite different in purpose, content, and structure, there is one area in which they are comparable. This area of comparison is the percentage of success of the process improvement efforts. The DISA survey asked whether the "organization believed the project(s) was(/were) successful?" 74.7% of the respondents felt that their organization's project was "very successful" or "somewhat successful." This compares very favorably with the results gathered in the current survey (DISA, 1994:2). 74.8% of the ratings comparing the process that resulted from the improvement efforts to the process that existed prior to the efforts rated the resulting process better than the pre-existing process.

Survey Reliability

Parallel questions were used in several areas in this survey to assess reliability. Questions 6-9, which dealt with the definition of the process improvement effort, were constructed in a parallel fashion and yielded a Cronbach alpha reliability coefficient of .80.

Parallel questions were also used concerning whether the process improvement technique contributed to the process improvement effort. These pairs included Questions 15 and 16, 20 and 21, 25 and 26, 30 and 34, and 38 and 39. The results are contained in Table 4-7.

Another significant area where reliability was also tested was in the measurement of the process improvement success. Parallel questions were used for each of the four process performance measures used for this purpose. The Cronbach alpha coefficient for these four pairs of questions is contained in Table 4-8.

TABLE 9. CRONBACH ALPHA COEFFICIENT FOR QUESTIONS CONCERNING TECHNIQUE CONTRIBUTIONS

	Strategic Planning Q. 15, 16	Process Modeling Q. 20, 21	Activity Based Costing Q. 25, 26	Benchmark -ing Q. 33, 34	Simulation Q. 38, 39
Coefficient	.78	.93	.52	.50	.95

TABLE 10. CRONBACH ALPHA COEFFICIENT FOR QUESTIONS CONCERNING THE SUCCESS OF PROCESS IMPROVEMENT EFFORTS

	Fitness for Purpose Q. 40, 44	Conformance to Standards Q. 41, 45	Process Time Measure Q. 43, 46	Process Cost Measure Q. 44, 47
Coefficient	.94	.70	.74	.93

Summary

The responses to the current survey provide valuable information and insight concerning the use of strategic planning, activity modeling, activity based costing, benchmarking, and simulation in process improvement projects. Despite the small sample, the results of the survey support the assumption that there is a definable difference between BPR and TQM processes and that the respondents were consistent in the definition of their projects. The survey revealed a surprising level of success for BPR projects. This level of reported success mirrored that of the earlier DISA study. In addition, it appeared that each of the five specific techniques were being utilized in BPR efforts and that the users felt that the techniques were contributing to the success of their projects. The users also responded that their organizations were using the appropriate level of resources for the successful accomplishment of each technique. The author presents his own conclusions and recommendations in the following chapter.

V. Conclusions and Recommendations

Chapter Overview

The final chapter of this thesis presents the conclusions and recommendations stemming from this research effort. The conclusion section of this chapter outlines the ramifications of the research on the research problem and investigative questions. The recommendation section outlines some of the lessons learned during this study and presents recommendations for future research.

Conclusions

Research Problem. The research problem of this study was to undertake a systematic, scientific study of business process reengineering in the DoD. The goal required that the techniques of BPR be broken down and evaluated in a scientific and rigorous manner concerning whether they added value to the process. This was a broad and ambitious goal that this study only began to accomplish. Time and resource constraints were only two of the limiting factors of this study. The difficulty in getting approval to survey all of the DoD organizations severely restricted the sample size of this study. In addition, a survey had to be constructed from scratch and tested. This was necessitated because of the lack of existing models which could be built upon or adapted for this purpose.

Perhaps, one of the most significant results of this study was the creation of measurement items concerning the definitions of BPR and TQM that were used in the survey instrument. The survey items allowed the respondents to classify their project improvement efforts in a consistent fashion. This was an important step that had not been addressed in the previous DISA study. If there is a difference between BPR projects and

TQM projects, respondents should be able to classify their projects accordingly. This study successfully accomplished this objective.

Investigative Questions. The original intent of the first investigative question of this study was to measure which of the specific techniques contributed to the success of process improvement efforts. However, because there was very little variance in the success of the process improvement efforts, it was not possible to compare successful projects and unsuccessful projects to discern whether the presence or absence of a specific technique could be linked to the success or failure of projects. In fact, there was only one project that rated the new process as inferior to the pre-existing process. Because of the lack of variance, the only substantive analysis concerning the contribution of each technique had to be directly extracted from the questions in the survey concerning the contribution of the techniques. This question did not reveal any surprising information. The majority of the respondents that utilized a specific technique reported that it contributed to the success of the process improvement effort.

A central task in this study was how to determine whether a project was successful The author finally decided upon the use of four process performance measures that the respondent was asked to use in a comparison of the process prior to improvement efforts and after the improvement efforts. These measurement items revealed consistent yet surprising results. These results revealed a surprisingly high level of reported success similar to those obtained by DISA. Approximately seventy-five percent of the respondents rated their projects as successful. These results differ greatly with the reported failure rate of approximately 70% in the private sector (Bashein, 1994:7).

There are two possible reasons for the surprising success rate of BPR projects found in this study. The first reason is the existence of a methodology to guide projects. Unlike most private organizations, the DoD has a methodology to guide BPR efforts. This may have resulted in a higher than expected success rate. A second explanation is

that the military environment may be responsible for a possible inflation of the success rate. Military members have an incentive to stress the positive aspects of projects and improvement efforts, because the military environment might be less forgiving of failure than private organizations. This incentive might be exacerbated by the lack of bottom line measures of success in public organizations. Whereas project impacts are directly reflected in the financial fortunes of private organizations, the bottom line impact in the public sector may be more difficult to ascertain. This may result in military organizations exaggerating the success of the BPR efforts, because of a lack of bottom line measurement. As process improvement efforts become more common in the military, process measurements will become more prevalent and will allow the comparison of pre-improvement processes to post-improvement processes.

The last investigative question concerned whether the resources expended in the use of each technique was appropriate. The study also revealed that the majority of the respondents felt that the resources expended for each technique was appropriate.

While the study did not reveal any significant surprises that could be used to modify the existing methodology of BPR projects within the DoD, the study did provide a basic step in the scientific validation of the methodology.

Recommendations

It is highly recommended that further research on BPR within the DoD be pursued. The following recommendations result form this study.

Larger Sample Size. The small sample size of this study severely limits the power of the findings. It is hoped that a larger survey sample consisting of other services in the DoD could be surveyed using or building upon the instrument developed in this study. BPR represents an important methodology that must be employed to its maximum potential in this era of down-sizing and reorganization. Only through future studies that

employ scientific rigor can the DoD make the proper decisions that will help in the reshaping and restructuring.

Survey Administration. It is recommended that an organization whose control spans several services in the DoD be the central point of contact and office of primary responsibility for future DoD surveys. Survey approval and administration is much simpler and effective if done by an organization with the authority to directly survey organizations in several services. A study conducted by such an organization would also enable the inclusion of a much larger sample size. BPR is a DoD issue and should be studied as such.

Instrument Modification. Any study that intends to use or build upon the survey instrument established in this study should modify some of the questions in the instrument. Specifically, a question should be added for each technique which states that the organization devoted less than the required amount of resources to the use of the specific technique. The absence of such a question in this study eliminated the opportunity to evaluate the reliability of the responses concerning the appropriateness of resource allocation.

Field Studies. Other areas of research that would be valuable concerning BPR would include field studies that compared process measures of pre-improvement and post-improvement processes. The actual comparison of pre-improvement process measures to post-improvement measures would be invaluable in helping to evaluate the level of success of BPR projects.

Other. Other areas of interest for future research include barriers to successful BPR implementation and techniques to overcome these barriers. These areas were addressed in the DISA survey, and future studies may be done to validate and expand their findings. The current literature on BPR contains much anecdotal evidence concerning the barriers to change and scientific studies in this area are essential to improving the DoD's

understanding of these issues. The DoD must make continuous efforts to optimize the opportunities for successful reengineering.

Summary

BPR is an essential concept that will be used to meet the demands of reshaping the way that DoD conducts business. Only through careful application of BPR techniques will the DoD be able to achieve the radical and fundamental improvement in our business processes that are required to ensure that the DoD will be able to continue to meet its mission in the face of the challenges that the future holds. This necessitates that BPR techniques be scientifically evaluated and studied. This study has resulted in the creation of a survey instrument that can be used to evaluate the contribution of techniques utilized in BPR efforts, and revealed some preliminary insights into the effectiveness of some of the techniques employed in the DoD BPR methodology. Further use of this instrument in the study of BPR within the DoD is highly recommended.

Appendix A. Survey Cover Letter

USAFSCN9548

MEMORANDUM FOR SURVEY RESPONDENTS

FROM: AFIT/LAA (1 Lt Thomas McDonnell)
2950 P. St.
WPAFB, OH 45433-7765

SUBJECT: Business Process Reengineering Survey Package

1. We are currently undertaking a study to investigate the effectiveness of Business Process Reengineering initiatives within the Department of Defense. As a recent respondent to a DISA survey on BPR, we would like to elicit your support in a follow-up effort to evaluate the effectiveness of the current DoD methodology and tools used.

2. This questionnaire is not a test and there are no incorrect answers. Please take the time to answer all of the questions thoroughly. All responses to the survey will remain anonymous. The information you provide will be used to evaluate the effectiveness of the techniques used in the DoD Business Process Reengineering methodology. It should take you approximately 15 minutes to answer this survey.

3. Participation in this research is strictly voluntary, but we would appreciate your assistance in this study. We hope the results will allow the DoD to improve the guidance, support and training they can offer you for future reengineering efforts. Please return the this survey package by 15 Jun 95 to the address indicated in the survey. If you have any comments or require additional information please contact me at AFIT/LAA, DSN 785-7777, ext 2178, or e-mail me at TMCDONNE@AFIT.AF.MIL. Thank you in advance for your time and participation in this valuable effort.

THOMAS M. MCDONNELL, 1t Lt, USAF
Graduate Student, GIR 95-D
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Attachment:
1. Survey
2. AFIT Form 11C
3. Return Envelope

Appendix B. Business Process Reengineering Survey

Please follow these guidelines when completing the survey: use a #2 pencil to answer all of the following questions; choose the one best answer for each question and fill in the circle on the provided answer sheet; please erase cleanly any answers you wish to change; you do not need to fill in your name; all survey responses are anonymous.

1. Please identify the DoD component in which your organization is located.

1	2	3	4	5	6	7
Army	Navy	USMC	JCS	Air Force	OSD	Other

2. Did the organization use DoD 8020.1-M to guide their process improvement project?

1	2	3
Yes	No	Do Not Know

3. Did the organization receive training on the process improvement methodology specified in DoD 8020.1M?

1	2	3
Yes	No	Do Not Know

4. If training was received, which of the following techniques did the training cover? (fill in all of the circles that apply)

1	2	3	4	5
Strategic planning	IDEF0 modeling	Activity based costing	Benchmarking	Simulation

There are differences between the process improvement approaches of Business Process Reengineering and Total Quality Management that are important for the purpose of this particular study. The following questions will help us to determine which definition best fits your organizations process improvement effort.

A *Total Quality Management* approach to process improvement can be defined as: the redesign of a single business process within one functional area with the goal of achieving incremental improvements (less than 10%) in cost, quality, and/or customer service. An example of a *Total Quality Management* approach could be the establishment of process metrics and removal of product inspection in an effort to continuously improve a process.

A *Business Process Reengineering* approach to process improvement can be defined as: the fundamental redesign of a business process which crosses several functional areas with the goal of achieving radical improvements (greater than 50%) in cost, quality, and/or customer service. An example would be Ford's reengineering of their accounts payable processes. Ford radically altered their accounts payable processes by using the capabilities of technologies such as on-line databases to institute invoiceless processing. Ford was able to reduce the required work force by 75% while increasing the simplicity, accuracy, and control of their financial information.

5. Based upon these definitions and examples, your organization's process improvement project can best be described as:

1	2	3
Total Quality Management	Business Process Reengineering	Undecided

Please answer the following questions by filling in the circle on the answer sheet that corresponds with the appropriate response on the scale below.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**

6. Our process improvement effort attempted to achieve improvement greater than 50% in cost, quality, and/or customer service.

7. Our process improvement effort was aimed at achieving improvement less than 10% in cost, quality, and/or customer service.

8. Our process improvement recommendations involved the use/introduction of information technologies.

9. Our process improvement effort crossed several functional areas.

10. Our organization has a strategic plan.

(If your organization does not have a strategic plan skip to question 17)

11. Our process improvement effort directly resulted from an issue/problem identified from our strategic planning process.

12. Our process improvement effort directly supported one or more goals contained in our strategic plan.

13. My organization devoted the correct amount of resources (time, money, manpower) to the process of strategic planning.

14. My organization devoted more than the required amount of resources (time, money, manpower) that were necessary for the successful accomplishment of strategic planning.

15. Strategic planning contributed to the success of our process improvement effort.

16. Strategic planning was not useful to our process improvement effort.

17. My organization conducted IDEF0 modeling as part of its process improvement methodology.

(If your organization did not conduct IDEF0 modeling skip to question 22)

18. My organization devoted the correct amount of resources (time, money, manpower) to the process of IDEF0 modeling.

19. My organization devoted more than the required amount of resources(time, money, manpower) that were necessary for the successful accomplishment of IDEF0 modeling..

20. IDEF0 modeling contributed to the success of our process improvement effort.

21. IDEF0 modeling was not useful to our process improvement effort.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**

22. My organization conducted activity-based costing as part of its process improvement methodology.

(If your organization did not conduct activity based costing skip to question 27)

23. My organization devoted the correct amount of resources (time, money, manpower) to the process of activity based costing.

24. My organization devoted more than the required amount of resources (time, money, manpower) that were necessary for the successful accomplishment of activity based costing.

25. Activity based costing contributed to the success of our process improvement effort.

26. Activity based costing was not useful to our process improvement effort.

27. My organization used benchmarking as part of its process improvement methodology.

(If your organization did not use benchmarking skip to question 35)

28. My organization benchmarked the process that was to be improved with processes that were similar within the organization.

29. My organization benchmarked the process that was to be improved with processes that were similar and found in other organizations.

30. My organization benchmarked the process that was to be improved with processes that were found in different industries.

31. My organization devoted the correct amount of resources (time, money, manpower) to benchmarking.

32. My organization devoted more than the required amount of resources (time, money, manpower) that were necessary for the successful accomplishment of benchmarking.

33. Benchmarking contributed to the success of our process improvement effort.

34. Benchmarking was not useful to our process improvement effort.

35. My organization used simulation as part of its process improvement methodology.

(If your organization did not use simulation skip to question 40)

36. My organization devoted the correct amount of resources (time, money, manpower) to simulation.

37. My organization devoted more than the required amount of resources (time, money, manpower) that were necessary for the successful accomplishment of simulation.

38. Simulation contributed to the success of our process improvement effort.

39. Simulation was not useful to our process improvement effort.

The following questions ask you to compare the process that was created by your organization's process improvement efforts to the process that existed prior to process improvement. Use the following rating scale to express your own feelings about how the new process compares to the process that existed prior to the process improvement effort.

1	2	3	4	5
Decidedly Worse	**Worse**	**Neither Better nor Worse**	**Better**	**Decidedly Better**

40. The ability of the process to provide a product or service that meets the needs of the customers.

41. The ability of the process to produce a high quality product or service.

42. The process response times.

43. The efficiency of the process.

44. The ability of the process to meet the needs of the customers.

45. The ability of the process to conform to required standards.

46. The cycle time of the process.

47. The productivity of the process.

Appendix C. Survey Results

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10	Case 11
Question 1	5	5	5	5	5	5	6	5	5	5	5
Question 2	1	1	1	2	1	2	1	2	2	3	3
Question 3	1	1	1	2	1	1	1	2	2	3	3
Question 4	3	1,2,4	2,3		2,3	1,2,3,4,5	1,2,3,4,5	1,4			1,2,3,4
Question 5	3	2	2	1	2	2	2	2	1	1	2
Question 6	2	5	4	4	4	5	5	4	2		4
Question 7	5	1	1	1	2	1	1	1	2	2	1
Question 8	1	5	4	5	4	5	5	5	5	1	5
Question 9	5	5	4	2	2	5	4	5	4	4	4
Question 10	4	3	4	4	3	4	5	5	5	4	4
Question 11	1	1	4	3		3	4	5	4	2	3
Question 12	4	2	4	4		5	4	5	4	4	3
Question 13	2	1	3	3		4	1	5	2	2	5
Question 14	1	4	2	3		2	1	2	2	2	3
Question 15	2	2	4	4		4	4	5	3	2	4
Question 16	5	1	2	2		1	2	1	2	3	1
Question 17	1	5	4	2	5	5	2	1	1	1	3
Question 18		5	4		4						
Question 19		1	2		1						
Question 20		5	4		4						
Question 21		1	2		1						
Question 22	5	3	4	4	2		2	1	1	1	3
Question 23	5		4	3	3						3
Question 24	1		2	2	3						2
Question 25	4		4	4	1						3
Question 26	1		2	1	2						1
Question 27	1	5	4	5	1		5	5	2	4	4
Question 28		5	4	4		5	4	1		4	4
Question 29		5	4	5			5	5		4	4
Question 30		4	2	3			2	1		3	1
Question 31		4	4	4			4	5		2	2
Question 32		2	2	2			1	2		2	1
Question 33		4	4	5			4	4		3	3
Question 34		2	2	1			2	1		3	1
Question 35	1	2		2	1		4	1	1	1	1
Question 36							4				
Question 37							1				
Question 38							2				
Question 39							4				
Question 40		5	4	5			4	5	4	4	5
Question 41		5	4	5			3	5	3	3	5
Question 42		5	5	4			5	5	4	4	4
Question 43		5	5	4			4	5	5	4	5
Question 44		5	5	4			4	5	3	4	5
Question 45		4	4	4			3	5	3		5
Question 46		5	4	4			4	5	5	3	5
Question 47		5	5	4			4	5	5	3	5

	Case 12	Case 13	Case 14	Case 15	Case 16	Case 17	Case 18	Case 19	Case 20	Case 21
Question 1	5	5	5	5	5	5	5	5	5	5
Question 2	2	3	1	1	1	1	3	1	1	1
Question 3	2	3	1	1	1	2	3	1	1	1
Question 4	2,3		2,3	2	1,2			1,2,3,4	2,3,4,5	2,3,4
Question 5	1	1	2	1	2	1	2	2	2	2
Question 6	3	4	2	1	4	2	3	2	5	3
Question 7	3	3	2	5	1	3	3	1	1	1
Question 8	3	4	4	2	4	4	4	5	5	4
Question 9	3	4	4	1	5	3	4	5	5	4
Question 10	4	2	4	4		2	4	3	5	4
Question 11	2		2	1			1		4	3
Question 12	2		2	2			2		4	5
Question 13	2		3	1			2		4	3
Question 14	4		3	1			2		2	2
Question 15	1		3	2			2		3	4
Question 16	4		3	5			2		3	2
Question 17	2	2	4	1		4	2	5	5	5
Question 18	1		2	1	4	2		2	4	5
Question 19	1		2		3	1		1	2	2
Question 20	1		4		3	4		5	4	2
Question 21	4		2		3	3		1	1	4
Question 22	3	2	4		1	2	2	5	5	4
Question 23	4		2					4	4	4
Question 24	4		2					1	2	2
Question 25	4		3					4	5	2
Question 26	4		3					2	1	4
Question 27	4	2	4	2		4	2	2	5	4
Question 28	4		2		2	2			2	2
Question 29	4		4		2	4			5	4
Question 30	4		4		2	2			5	4
Question 31	4		2		2	3			4	3
Question 32	4		2		2	2			2	3
Question 33	4		4		3	4			3	3
Question 34	4		2		3	2			3	2
Question 35	5	2	4	1	2	2	2	2	5	4
Question 36	5		2						4	4
Question 37	5		2						2	2
Question 38	5		3						4	4
Question 39	2		3						2	2
Question 40	1	3	4	3	4	4	2	4	5	3
Question 41	1	4	4	4	4	4	2	4	5	3
Question 42	4	3	4	2	4	4	2	3	3	4
Question 43	4	4	4	3	4	4	3	4	4	4
Question 44	1	4	4	3	5	5	2	4	5	3
Question 45	4	4	4	2	5	3	2	4	5	3
Question 46	4	4	4	4	4	4	2	3	3	4
Question 47	4	4	4	3	4	3	2	4	4	4

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Vita

Captain Thomas M. McDonnell was born in Chicopee, Massachusetts on 25 July 1968. He graduated from Keene High School in 1986 and then attended Phillips Exeter Academy in Exeter, NH. Following his graduation from Exeter, he attended Amherst College in Amherst, MA. He graduated in May 1991 with a Bachelor of Arts in Economics. After receiving his commission into the United States Air Force through the Reserve Officers Training Corps and completing the Information Management Course at Keesler AFB, Captain McDonnell was assigned to the 42 Bomb Wing, Loring AFB, ME.

Captain McDonnell was assigned as the Squadron Section Commander for the 42d Supply Squadron and fulfilled this duty for two years. During this period of time, he deployed to Saudi Arabia in support of Operation Southern Watch, and served as the Executive Officer for the 4404th Operations Group. Upon his return, Captain McDonnell was selected as the Director of Quality for the 42d Bomb Wing.

With the closure of Loring AFB, Captain McDonnell entered the Air Force Institute of Technology at Wright-Patterson AFB, Ohio, and graduated in December 1995 with a Masters degree in Information Resource Management. Upon graduation, he was assigned as the Chief, Base Information Management at Travis AFB in California.

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13. ABSTRACT *(Maximum 200 words)*

The Department of Defense's Corporate Information Management Initiative is part of an effort to achieve savings through specified programs focused on business process improvement. A major process improvement methodology being used by the DoD is Business Process Reengineering (BPR). BPR offers the possibility for a fundamental rethinking and radical redesigning of DoD business processes, but there has been little systematic study of the effectiveness of the various techniques used in BPR projects. This study evaluates whether organizations conducting BPR efforts using five specific techniques (strategic planning, activity modeling, activity based costing, benchmarking, and simulation) achieve improvement in critical process performance measures. The survey was sent to two Air Force sample groups. The first group consisted of respondents to the Defense Information Systems Agency 1994 Business Process Reengineering Survey, and the second group consisted of members of the Air Force Institute of Technology Information Resource Management e-mail list. The survey resulted in a small sample of cases that were analyzed using descriptive statistics. The results of the survey indicate a surprisingly high success rate for BPR projects. Reliability analysis of the survey data was conducted and conclusions and recommendations for further research are presented.

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